PROJECT NUMBER: 2501
PROJECT TITLE: Smoke Chemistry
PROJECT LEADER: R. Comes
PERIOD COVERED: September 1988

I. SIDESTREAM SMOKE

A. Objective: Conduct studies on sidestream smoke including: development of methods for collection and analysis of sidestream gas phase and semivolatiles; visibility determinations; analysis of selected materials relating to sidestream odor and irritation; development of potential proprietary products.

B. Status: (1) The development of satisfactory procedures for analysis of sidestream gas phase components continues. (2) Visibility determinations have been conducted on various cigarette types. Studies utilizing the apparatus being developed for CORESTA sidestream measurements have been carried out independently and in conjunction with visibility measurements. (3) Modifications continue in an attempt to design a "CORESTA" apparatus for sidestream determinations. (4) A study to compare the quartz halogen lamp with a green HeNe laser as light sources was carried out on the 5-port visibility apparatus. Construction of an 8-port apparatus continues. (5) Initial efforts in anticipation of SS chamber construction approval have continued.

C. Results: (1) Compounds from sidestream smoke ranging in volatility from propane to beyond nicotine have been observed using the Tekmar gas phase method. A plateau has been reached in the identification of new materials in this "unconventional" gas phase. To address this problem, a heart cutting system has been installed and is currently under investigation. A recurring problem in the Tekmar system is plugging of liquid nitrogen cold traps with water or large amounts of major components. This limits the sample size and thus the capability for detection of ultra-trace components that may be important flavor compounds. (2) Visibility data was generated on the 17-port apparatus on a series of reconstituted tobacco sheets with varied humectant types and levels. No significant differences were observed between any of the models regardless of type or level of added humectant. Cigarettes prepared in the reduced density rod program were evaluated on the CORESTA apparatus and on the 17-port visibility system. The data showed that, as expected, reducing the amount of filler reduces the TPM, DPM, nicotine and tar for both MS and SS, other parameters being equal. However, on a mg/g of tobacco consumed or on a per puff basis, the opposite trend is observed. 17-port visibility measurements (determined over only a portion of the total static burn time) support this trend in that the low density rod cigarette demonstrates higher visibility than the normal weight control. (3) A prototype of a "new" SS collection chamber has been designed and constructed. It has been dubbed "Enclosed Fishtail (EF)" or "Enclosed Chamber (EC)" and is designed to be used with an electric cigarette lighter and to accomodate 100mm cigarettes. IR4F cigarettes have been smoked using this chamber to examine the effects of varied flow rates on SSTPM, SS moisture and SS nicotine. (4) The study to

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determine the suitability of a laser as the light source for visibility measurements gave disappointing results. The light was not nearly as stable as that from the quartz halogen lamp and the visibility charts were considerably noisier. For the present, either the quartz halogen or the Xenon arc lamps will continue to be used. A hood has been designed and built for the 8-port monitor. The smoking machine has been checked out and has the optical system installed. (5) A meeting was held with Borgwaldt representatives in regard to an in-chamber smoking machine. They will respond to construction and modification questions shortly. Software packages for control of cigarette smoking and data collection are being evaluated by CAD personnel.

D. Plans: (1) Continue optimization of methods for analysis of sidestream gas phase. (2) Visibility and CORESTA MS and SS measurements will be run as required. (3) Results of the "EC" chamber smokings will be compared with data generated previously with the PM and European chambers. Additional modifications will be made as necessary. (4) Construction of the 8-port visibility apparatus should be completed in the next month. Smoking runs will commence shortly for instrument check out and determination of data precision and reproducibility. (5) Long term problems inherent in the proposed chamber construction will continue to be addressed in anticipation of 650 approval.

II. MISCELLANEOUS

A. A study is underway utilizing the Texmar unit as a potential instrument for analysis of tobacco volatiles.

B. Pyrolysis/GC/MS and GC/MS analyses continue as requested.

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